

I claim:

1. An improvement in a method for communication in a computer network to a plurality of receivers in a multicast session comprising: transmitting a multicast message to said plurality of receivers from a sender through said computer network; and

processing the transmitted multicast message in every receiver at or after a certain time defined as the official release time, which is chosen and sent to every receiver by the sender such that when both the sender and plurality of receivers remain healthy during the multicast session, the probability of the multicast being completed before the official release time is at or above a user selected level.

2. An improvement in a method for communication in a computer network to a plurality of receivers comprising:

transmitting a multicast message from a sender to said plurality of receivers through said computer network;

processing the received multicast message in said plurality of receivers only after a time defined as the official release time, which is chosen and sent to every receiver by the sender such that the multicast is cancelled, when the message cannot be delivered to a receiver after the sender makes a pre-

9 determined number of attempts or when the sender becomes disabled before it
 10 can confirm the success of the multicast;
 11 generating a cancellation notice by any member; and
 12 performing a cancellation step by all intended healthy receivers and the
 13 healthy sender before the official release time.

1 3. An improvement in a method for communication in a computer network to
 2 a plurality of receivers comprising:

3 terminating a multicast session at an official release time associated with
 4 the multicast message with every member of the multicast group, including the
 5 sender and every intended receiver, by letting a receiver decide at the official
 6 release time that a multicast session has been successfully completed when all
 7 of the following conditions are met:

8 (i) neither the receiver nor a local communication manager has
 9 received any fault detection report from local or remote fault detectors, or
 10 where the receiver or local communication manager has received fault
 11 detection reports from the local and/or remote fault detectors, but judged that
 12 the faults detected could not have impacted the correctness of the multicast;
 13 and

14 (ii) The receiver has received the multicast message and returned an
 15 ACK-message; and

16 (iii) The receiver has not received any cancellation notice from the
17 sender.

1 4. An improvement in a method for communication in a computer network to
2 a plurality of receivers comprising: terminating a multicast session at an official
3 release time associated with the multicast message with every member of the
4 multicast group, including the sender and every intended receiver, by letting the
5 sender decide at the official release time that a multicast session has been
6 successfully completed when all of the following conditions are met:

7 (i) Neither the sender nor the local communication manager has
8 received any fault detection report from the local or remote fault detectors, or
9 where the sender or the local communication manager has received fault
10 detection reports from the local and/or fault detectors, but judged that the
11 faults detected could not have impacted the correctness of the multicast
12 about to be concluded; and

13 (ii) The sender has received an ACK-message from every intended
14 receiver.

1 5. The improvement of claim 3 further comprising:

2 terminating a multicast session at an official release time associated with
3 the multicast message with every member of the multicast group, including the
4 sender and every intended receiver, by letting the sender decide at the official

5 release time that a multicast session has been successfully completed when all
6 of the following conditions are met:

7 (i) Neither the sender nor the local communication manager has
8 received any fault detection report from the local or remote fault detectors, or
9 where the sender or the local communication manager has received fault
10 detection reports from the local and/or fault detectors, but judged that the
11 faults detected could not have impacted the correctness of the multicast
12 about to be concluded; and

13 (ii) The sender has received an ACK-message from every intended
14 receiver.

1 6. An improvement in a method for communication in a computer network to
2 a plurality of receivers comprising:

3 terminating a multicast session in every healthy member of a multicast
4 group, including a sender and every intended receiver with the conclusion of the
5 multicast session on the failure and the cancellation of the multicast session at or
6 before arrival of an official release time associated with a multicast message by
7 letting a receiver decide at or before the official release time that a multicast
8 session has been cancelled when at least one of the following conditions is met:

9 (i) The receiver has received a cancellation notice from the sender; or

(ii) The receiver has not received the multicast message but somehow learned of the multicast session in process as well as the associated official release time; or

(iii) The receiver or a local communication manager has received fault detection reports from local and/or remote fault detectors and judged that the faults detected were in the local node and due to the faults detected, the multicast session must be concluded as a failure; or

(iv) The receiver or local communication manager has received fault detection reports from the local and/or remote fault detectors and judged that the faults detected were outside the local node and due to the faults detected, the multicast session must be concluded as a failure.

7. An improvement in a method for communication in a computer network to a plurality of receivers comprising:

terminating a multicast session in every healthy member of a multicast group, including a sender and every intended receiver with the conclusion of the multicast session on the failure and the cancellation of the multicast session at or before arrival of an official release time associated with a multicast message by letting the sender decide at or before the official release time that a multicast session has been cancelled when at least one of the following conditions is met:

(i) The sender has made a predetermined number of attempts to send the multicast message to an intended receiver, but the sender has not

received an ACK-message from the intended receiver within a predetermined time bound and thus the sender has sent a cancellation notice to every intended receiver; or

(ii) The sender or a local communication manager has received fault detection reports from the local and/or remote fault detectors and judged that the faults detected were in the local node and due to the faults detected, the multicast must be concluded as a failure and thus the sender has sent a cancellation notice to every intended receiver; or

(iii) The sender or a local communication manager has received fault detection reports from the local and/or remote fault detectors and judged that the faults detected were outside the local node and due to the faults detected, the multicast session must be concluded as a failure and thus the sender has sent a cancellation notice to every intended receiver.

8. The improvement of claim 6 further comprising:

terminating a multicast session in every healthy member of a multicast group, including a sender and every intended receiver with the conclusion of the multicast session on the failure and the cancellation of the multicast session at or before arrival of an official release time associated with a multicast message by letting the sender decide at or before the official release time that a multicast session has been cancelled when at least one of the following conditions is met:

(i) The sender has made a predetermined number of attempts to send the multicast message to an intended receiver, but the sender has not received an ACK-message from the intended receiver within a predetermined time bound and thus the sender has sent a cancellation notice to every intended receiver; or

(ii) The sender or a local communication manager has received fault detection reports from the local and/or remote fault detectors and judged that the faults detected were in the local node and due to the faults detected, the multicast must be concluded as a failure and thus the sender has sent a cancellation notice to every intended receiver; or

(iii) The sender or a local communication manager has received fault detection reports from the local and/or remote fault detectors and judged that the faults detected were outside the local node and due to the faults detected, the multicast session must be concluded as a failure and thus the sender has sent a cancellation notice to every intended receiver.

9. An improvement in a method for communication in a computer network to a plurality of receivers in a multicast session comprising the steps of:

transmitting a multicast message to said plurality of receivers from a sender through said computer network;

sending an official release time to every receiver from the sender; and

processing the transmitted multicast message in every receiver at or after the official release time, which is chosen so that when both the sender and

plurality of receivers remain fault free during the multicast session, the probability of the multicast being completed before the official release time is at or above a predetermined level.

10. The improvement of claim 9 where the multicast is completed when at least one of the following conditions is met:

- (i) When the communication of the multicast message to the last one of said plurality of receivers is successfully completed; or
- (ii) When the communication of the multicast message to any of the receivers fails.

11. The improvement of claim 10 where the sender receives an ACK-message from the last one of said plurality of receivers within a predetermined acknowledgment time bound, ATB.

12. The improvement of claim 9 further comprising the steps of:

- canceling the multicast, when the message cannot be delivered to a receiver after the sender makes a predetermined number of attempts or when the sender becomes disabled before it can confirm the success of the multicast;
- generating a cancellation notice by any member; and
- performing a cancellation step by all intended fault-free receivers and the fault-free sender before the official release time.

13. The improvement of claim 9 further comprising the step of terminating a multicast session at an official release time associated with the multicast message with every member of the multicast group, including the sender and every intended receiver, by letting a receiver decide at the official release time that a multicast session has been successfully completed when all of the following conditions are met:

(i) neither the receiver nor a local communication manager has received any fault detection report from local or remote fault detectors; and

(ii) The receiver has received the multicast message and returned an ACK-message; and

(iii) The receiver has not received any cancellation notice from the sender.

14. The improvement of claim 9 further comprising the step of terminating a multicast session at an official release time associated with the multicast message with every member of the multicast group, including the sender and every intended receiver, by letting the sender decide at the official release time that a multicast session has been successfully completed when all of the following conditions are met:

(i) Neither the sender nor the local communication manager has received any fault detection report from the local or remote fault detectors; and

(ii) The sender has received an ACK-message from every intended receiver.

15. The improvement of claim 1 further comprising the steps of:

canceling the multicast, when the message cannot be delivered to a receiver after the sender makes a predetermined number of attempts or when the sender becomes disabled before it can confirm the success of the multicast;

generating a cancellation notice by any member; and

performing a cancellation step by all intended fault-free receivers and the fault-free sender before the official release time.

16. The improvement of claim 1 further comprising the step of terminating a multicast session at an official release time associated with the multicast message with every member of the multicast group, including the sender and every intended receiver, by letting a receiver decide at the official release time that a multicast session has been successfully completed when all of the following conditions are met:

(i) neither the receiver nor a local communication manager has received any fault detection report from local or remote fault detectors; and

(ii) The receiver has received the multicast message and returned an ACK-message; and

(iii) The receiver has not received any cancellation notice from the sender.

17. The improvement of claim 1 further comprising the step of terminating a multicast session at an official release time associated with the multicast message with every member of the multicast group, including the sender and every intended receiver, by letting the sender decide at the official release time that a multicast session has been successfully completed when all of the following conditions are met:

- (i) Neither the sender nor the local communication manager has received any fault detection report from the local or remote fault detectors; and
- (ii) The sender has received an ACK-message from every intended receiver.

18. An improvement in a computer network including a plurality of receivers in a multicast session comprising:

means for transmitting a multicast message to said plurality of receivers from a sender through said computer network;

means for sending an official release time to every receiver from the sender; and

means for processing the transmitted multicast message in every receiver at or after the official release time, which is chosen so that when both the sender and plurality of receivers remain healthy during the multicast session, the probability of the multicast being completed before the official release time is at or above a predetermined level.

19. The improvement of claim 18 further comprising:

transmitting a multicast message from a sender to said plurality of receivers through said computer network;

processing the received multicast message in said plurality of receivers only after a time defined as the official release time, which is chosen and sent to every receiver by the sender such that the multicast is cancelled, when the message cannot be delivered to a receiver after the sender makes a pre-determined number of attempts or when the sender becomes disabled before it can confirm the success of the multicast;

generating a cancellation notice by any member; and

performing a cancellation step by all intended healthy receivers and the healthy sender before the official release time.

20. The improvement of claim 19 where the means for processing the transmitted multicast message in every receiver has completed processing the multicast when at least one of the following conditions is met:

(i) When the communication of the multicast message to the last one of said plurality of receivers is successfully completed; or

(ii) When the communication of the multicast message to any of the receivers fails.

21. The improvement of claim 20 further comprising: means for canceling the multicast, when the message cannot be delivered to a receiver after the sender makes a predetermined number of attempts or when the sender becomes disabled before it can confirm the success of the multicast;

means for generating a cancellation notice by any member; and

means for processing a cancellation step by all intended healthy receivers and the healthy sender before the official release time.

22. The improvement of claim 20 further comprising means for terminating a multicast session at an official release time associated with the multicast message with every member of the multicast group, including the sender and every intended receiver, by letting a receiver decide at the official release time that a multicast session has been successfully completed when all of the following conditions are met:

(i) neither the receiver nor a local communication manager has received any fault detection report from local or remote fault detectors, or where the receiver or local communication manager has received fault detection reports from the local and/or remote fault detectors, but judged that the faults detected could not have impacted the correctness of the multicast; and

(ii) The receiver has received the multicast message and returned an ACK-message; and

(iii) The receiver has not received any cancellation notice from the sender.

23. The improvement of claim 20 further comprising means for terminating a multicast session at an official release time associated with the multicast message with every member of the multicast group, including the sender and every intended receiver, by letting the sender decide at the official release time that a multicast session has been successfully completed when all of the following conditions are met:

(i) Neither the sender nor the local communication manager has received any fault detection report from the local or remote fault detectors, or where the sender or the local communication manager has received fault detection reports from the local and/or fault detectors, but judged that the faults detected could not have impacted the correctness of the multicast about to be concluded; and

(ii) The sender has received an ACK-message from every intended receiver.

24. The improvement of claim 20 further comprising means for terminating a multicast session in every healthy member of a multicast group, including a sender and every intended receiver, with the conclusion of the multicast session

on the failure and the cancellation of the multicast session at or before arrival of an official release time associated with a multicast message by letting a receiver decide at or before the official release time that a multicast session has been cancelled when at least one of the following conditions is met:

(i) The receiver has received a cancellation notice from the sender; or

(ii) The receiver has not received the multicast message but somehow learned of the multicast session in process as well as the associated official release time; or

(iii) The receiver or a local communication manager has received fault detection reports from local and/or remote fault detectors and judged that the faults detected were in the local node and due to the faults detected, the multicast session must be concluded as a failure; or

(iv) The receiver or local communication manager has received fault detection reports from the local and/or remote fault detectors and judged that the faults detected were outside the local node and due to the faults detected, the multicast session must be concluded as a failure.

25. The improvement of claim 20 further comprising:

terminating a multicast session in every healthy member of a multicast group, including a sender and every intended receiver with the conclusion of the multicast session on the failure and the cancellation of the multicast session at or before arrival of an official release time associated with a multicast message by

6 letting the sender decide at or before the official release time that a multicast
7 session has been cancelled when at least one of the following conditions is met:

8 (i) The sender has made a predetermined number of attempts to send
9 the multicast message to an intended receiver, but the sender has not
10 received an ACK-message from the intended receiver within a predetermined
11 time bound and thus the sender has sent a cancellation notice to every
12 intended receiver; or

13 (ii) The sender or a local communication manager has received fault
14 detection reports from the local and/or remote fault detectors and judged that
15 the faults detected were in the local node and due to the faults detected, the
16 multicast must be concluded as a failure and thus the sender has sent a
17 cancellation notice to every intended receiver; or

18 (iii) The sender or a local communication manager has received fault
19 detection reports from the local and/or remote fault detectors and judged that
20 the faults detected were outside the local node and due to the faults detected,
21 the multicast session must be concluded as a failure and thus the sender has
22 sent a cancellation notice to every intended receiver.